NASA Activities

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Cover

Thanks to LANDSAT-2, launched Jan. 22, this Coast Guard cutter was able to battle its way through miles of sea ice running from four to 15 feet thick in the Antartica. The area is called Pine Island Bay. Never before had it been reached by ship. See LANDSAT articles on Pages 5, 10 and 12.

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Letter from Washington

Dr. James C. Fletcher

Dear Colleagues:

A driving force and the use of innovative techniques and ideas have brought NASA the image of a get-it-done agency, and the record backs up the reputation.

As we move ahead to an even more exciting era in aeronautical research and space exploration, we have added a new tool to enhance and symbolize the progressive path we have always followed.

Not as suspenseful as a Command and Service Module splashdown nor as dramatic as a Mariner flyby, it is nonetheless of major importance because it is designed to achieve maximum communication of the agency's program objectives, both internally and externally.

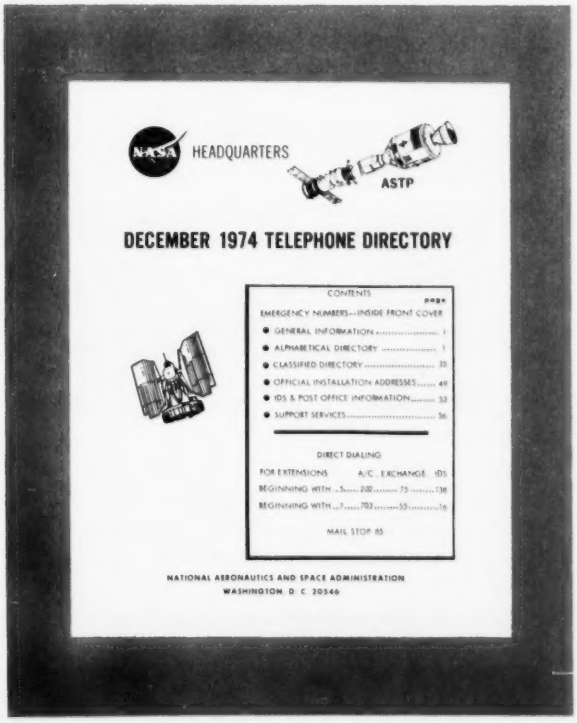
As most of you know by now, we have adopted a new system of graphics — the visual communications system by which we are known to those who read our publications, see our vehicle markings and signboards and the logotype that unmistakably brands them as NASA's.

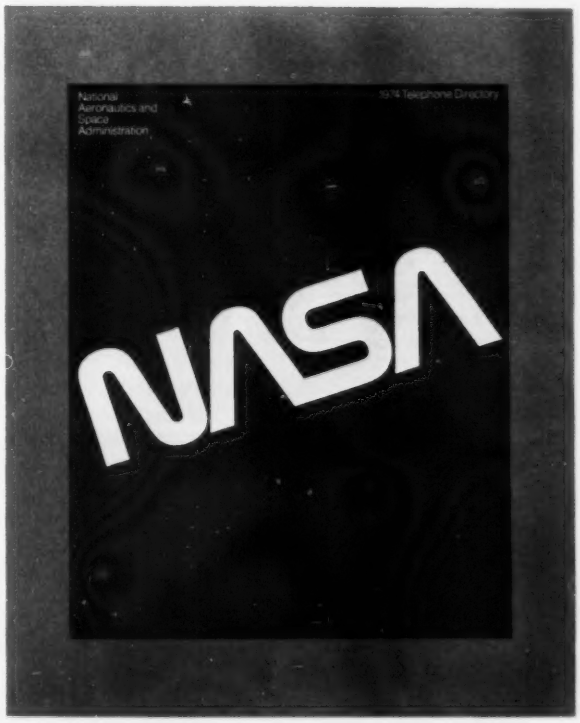
The new system focuses on the revised logotype, in which the letters "N-A-S-A" are reduced to their simplest form, replacing the red, white and blue circular emblem with the white block letters.

The last three issues of NASA ACTIVITIES have carried the new logo on the cover and the inside of the publication has undergone a gradual adoption of the new type faces and layout techniques that are being implemented agency-wide. I like what I have seen and now am convinced that good graphics is not a luxury but a necessity.

In adopting the system, NASA is in the forefront of the Federal Graphics Improvement Program of the National Endowment for the Arts. Last year, we took a look at the graphics used at Headquarters and the Centers. We felt that, while they were generally effective and adequate, there was room for improvement.

We decided to do something about it and we did. We convened a panel of leading outside experts to review our graphics. The panel recommended we upgrade our





"graphics profile." We then contracted with a nationally-recognized graphics design firm for a preliminary report and plan for implementation of a Graphics Improvement Program.

The most important end product of the new graphics program will be the development of a Graphics Standards Manual, the official policy document regarding NASA identification (use of logotype), graphic design and visual communication in general.

The manual will be a reference book for NASA designers which will set the tone and level of quality for all NASA graphics. It is expected to provide firm guidance in 80 to 90 percent of day-to-day visual communications problems.

Each element of the manual will be published and implemented as soon as possible. In this fashion, the program is moving ahead and development of in-depth guideline material runs concurrently with implementation.

In the coming months, representatives of Public Affairs and Danne & Blackburn, our graphics consultants, will visit Centers to discuss the graphics program with Center Directors and Center personnel.

My experience has shown that, in order to succeed, a program which departs from the accustomed must have the full support of every NASA employee. Top-level management must take the lead, our experts in the field of graphic design must follow, and all of us must see that the specifics are diligently monitored to insure that the standards of excellence are maintained.

Returning to the new logo, I think it is pleasing to the eye and gives a feeling of unity, technological precision, thrust and orientation toward the future. Unity, technology, pioneering achievement — that's what NASA is all about.

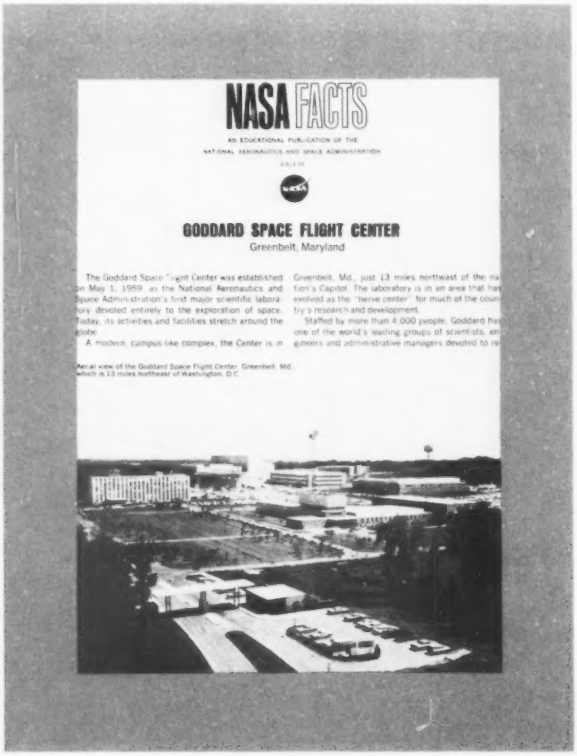
I think we were fortunate in recognizing early that our graphics could stand improvement; I am confident that the program we now have underway will be second to none in effectiveness either in government or indústry; and I solicit the enthusiastic support of each of you in adopting it as NASA's look of the future — now.

Sincerely,

James C. Fletcher
Administrator

NASA

NASA


NASA FACTS

AN EDUCATIONAL PUBLICATION OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

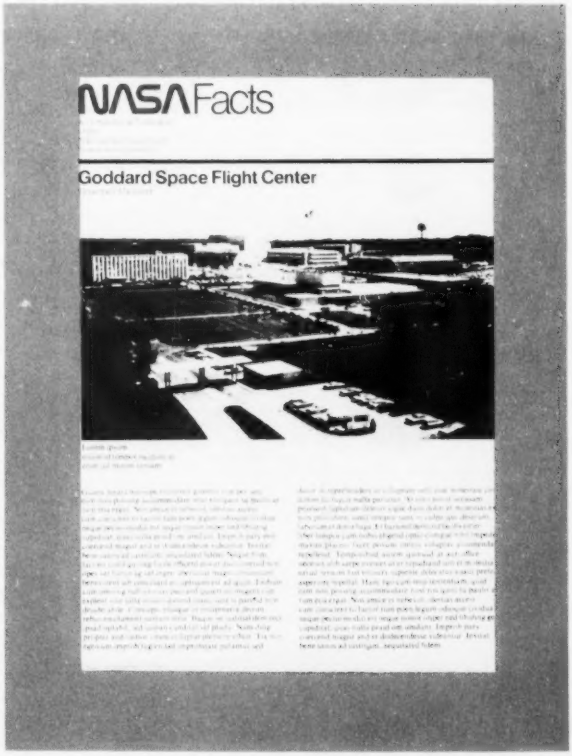
GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

The Goddard Space Flight Center was established on May 1, 1959, as the National Aeronautics and Space Administration's first major scientific laboratory devoted entirely to the exploration of space. Today, its activities and facilities stretch around the globe.

A modern, campus-like complex, the Center is in Greenbelt, Md., just 13 miles northeast of the nation's Capitol. The laboratory is in an area that has evolved as the "nerve center" for much of the country's research and development.

Staffed by more than 4,000 people, Goddard has one of the world's leading groups of scientists, engineers and administrative managers devoted to re-

Aerial view of the Goddard Space Flight Center, Greenbelt, Md., which is 13 miles northeast of Washington, D.C.


NASA Facts

Goddard Space Flight Center

Monthly NASA Highlights

Helios Spacecraft Makes Close-in Measurements of the Sun

The Helios spacecraft, making its closest approach to the Sun on March 15, 1975, withstood temperatures hot enough to melt lead and performed its mission as designed. The solar probe, traveling at a speed of 238,000 km (142,000 miles) per hour, came within 45 million km (28 million miles) of the Sun. The first detailed close-in measurements of the Sun's surface and the solar wind were made, accomplishing the primary scientific mission of the spacecraft.

The Helios, a cooperative United States/West Germany project, was launched from Cape Canaveral, FL, on Dec. 10, 1974, by NASA's Titan Centaur rocket. The probe carries three American and seven German experiment instruments.

The Helios will continue making scientific measurements as it travels through interplanetary space in its highly elliptical heliocentric orbit. The spacecraft will again pass close to the Sun in September.

Health/Educational Telecommunications Demonstrations

A Health/Educational Telecommunications (HET) demonstration was conducted using the Applications Technology Satellite (ATS) for exhibit at the Lincoln Center in New York City. The exhibit, called "The Future of Television and the Performing Arts," was held in conjunction with the annual meeting of the American Association for the Advancement of Science. The demonstration consisted of a video transmission of a ballet class in Denver being critiqued in real time by a dance master in New York. The video quality was excellent and the program well received by a standing-room-only audience at the Lincoln Center.

An Emergency Medical Training Program began in March, using the ATS-6 for video broadcast and the ATS-3 for voice interaction. The seven-week course, two hours per week, is designed for paramedics, policemen and firemen and is being transmitted from Denver to the HET sites in the Rocky Mountain Federation.

Sixth Annual Lunar Science Conference

Several hundred lunar and planetary scientists from the United States and abroad attended the Sixth Annual Lunar Science Conference during the week of March 17 at the Johnson Space Center. The scientists compared notes on what has been learned about the Moon.

This year's conference focused on six main topics: constraints on structure and composition of the deep interior; characteristics and movement of materials in the lunar regolith; characterization and evolution of the mare basins; characterization and evolution of the lunar crust; nature of impact processes and their effects on lunar materials; and the Moon as an interplanetary/interstellar probe.

LANDSAT Ground Station to be Built in Africa

The first LANDSAT ground station in Africa will be built near Kinshasa by ERTS-Zaire, an African government agency. The station will receive Earth resources data directly from NASA's LANDSAT satellites and will be able to produce both computer tapes and photographic imagery. Data from this area is currently stored on the LANDSAT-2 magnetic tape recorders and transmitted to ground stations in the U.S. The Earth resources satellites obtain data on most of the African continent from the northern border of Chad to South Africa and from Kenya to the Ivory Coast.

Use of Earth resources data from Africa has been increasing with 13 African nations and two international organizations involved in investigations. Zaire's new station will make copies of the data available to NASA as well as scientists and other groups requesting data of the region.

Developing nations have found satellite data particularly valuable in learning about their natural resources, mapping geological and man-made features and conducting agricultural research.

Tracking and Data Relay Satellite System (TDRSS)

NASA's Office of Tracking and Data Acquisition (OTDA) provides responsive and precision tracking, data acquisition, communications and related support to meet flight program requirements. The majority of support is provided through the Spaceflight Tracking and Data Network and the Deep Space Network, OTDA's two worldwide tracking network facilities.

The OTDA is planning to obtain the services of a Tracking and Data Relay Satellite System (TDRSS) through a long-term, leased-service contract under which the contractor will develop and implement the system and operate it to provide the required service to NASA. The service is scheduled to begin in late 1979. It is planned that the system will consist of two specialized relay satellites in

synchronous Earth orbit and a ground terminal located in the continental United States. With one satellite over the Atlantic ocean and the other over the Pacific Ocean, the system will relay data, commands and voice to and from mission spacecraft in near-Earth orbit and the ground control center, greatly improving tracking and data acquisition capabilities.

The relay satellite system will be capable of providing support to NASA spacecraft orbiting the Earth below 5,000 km, including the Space Shuttle and Spacelab and the free-flying automated spacecraft planned for the 1980s. It will provide at least 85 percent coverage of an orbital satellite as compared to the present 15 percent average coverage capability utilizing the current ground tracking system.

Global Air Sampling Program

The Lewis Research Center is managing a program to aid scientists in determining if emissions from jet aircraft and other pollution sources affect the Earth's atmosphere. The planned program calls for equipping four Boeing 747 jet aircraft with instrumentation to measure particles and gases in the upper atmosphere. The specially-equipped commercial aircraft will survey the nation's airlanes on regularly scheduled flight routes. The monitoring equipment functions automatically, recording data and using air filters to collect particle samples, and does not interfere with normal flight operations.

A Pan American Airways 747 has joined the United Airlines aircraft, which began operation in December, in the atmospheric sampling of carbon monoxide, ozone, water vapor and suspended particulates. Later this year a Quantas Airways of Australia jetliner is scheduled to join the Global Air Sampling Program (GASP) and, in 1976, with the jetliner of the Scandinavian Airline System, the GASP fleet will be complete. The data collected in this program is being used by NASA, the National Oceanic and Atmospheric Administration and other agencies studying the effects of pollutants in the upper atmosphere.

Measurement of Atmospheric Turbulence

At NASA's Flight Research Center, Edwards, CA, a specially instrumented B-57 aircraft will fly over the western portion of the U.S. to investigate invisible air turbulence, a natural phenomenon that can bump airplanes around without warning. In the Measurement of Atmospheric Turbulence (MAT) Program, approximately 40 flights will be made during the winter and spring months to gather detailed air turbulence measurements in meteorological conditions such as jetstreams, thermal turbulence and mountain waves. Instruments aboard the aircraft will measure the amount of energy in the various turbulence samples.

NASA's Langley Research Center will analyze the data for use in designing future aircraft to insure safe flight in turbulent air.

The Federal Aviation Agency and the National Oceanic and Atmospheric Administration will report the location of clear air turbulence. NASA will fly the B-57 on a straight line through the turbulence for at least 10 minutes. A meteorologist in the rear of the two-seat aircraft will use inertial navigation equipment to record the velocity and acceleration of the turbulence.

The project is a continuation of a similar program flown in 1972, but will use an improved instrumentation system for greater accuracy.

Seventh Year in Space for OSO-5

NASA's Orbiting Solar Observatory-5, launched Jan. 22, 1969, has begun its seventh year in orbit around the Earth. The OSO Program, which began with the launch of OSO-1 on March 7, 1962, provides specialized space observing platforms which return data on the Sun that cannot be obtained on the ground. Changes of solar phenomena are important to the understanding of solar physics and its effects on the Earth.

To date, seven OSOs have been launched, and a larger, more sophisticated observatory is scheduled to be launched in May, 1975.

The OSO-5 is obtaining data on the frequency and extent of eruptions occurring on the Sun's surface which affect the Earth's environment, weather and communications. Over a period of several years, the Commerce Department's National Oceanic and Atmospheric Administration has published daily maps of solar activity, using the information obtained by the OSO. These appear in their Geophysical Data Prompt Reports, which are used by scientists throughout the world.

Light Produces Hydrogen from Water

Hydrogen has been produced from water by the action of ultraviolet light in research conducted at the Massachusetts Institute of Technology (MIT) under a grant from NASA. Administered by the Langley Research Center, this work is part of the Office of Aeronautics and Space Technology's basic research program.

Production of hydrogen from water by light requires a titanium dioxide crystal and a small electrical potential, only two-tenths of a volt. This potential is much less than the 1.2 volts needed to decompose water by electricity alone.

The crystal acts as a photo-assistance agent, absorbing light and exchanging electrons with ions in the water. Oxygen is released from the crystal electrode while hydrogen evolves from a platinum electrode.

In the current experiments, the reaction converts only one percent of the light energy into chemical energy. Furthermore, visible light will not produce the reaction.

The principal investigator, Dr. Mark S. Wrighton of MIT, is now searching for ways to increase efficiency and to make the reaction work with visible light by trying different electrodes and reaction temperatures. Success in this

research could lead to economical production of hydrogen fuel directly from sunlight. Another possibility is a new, efficient way to change light into electricity.

Atomic Hydrogen Experiments

Research on the storage of atomic hydrogen is having success in experiments conducted by the Magnetics and Cryophysics Branch at the Lewis Research Center. This work is funded under the propulsion research program of the Office of Aeronautics and Space Technology.

The hydrogen molecular bond is the most energetic chemical bond per unit mass, so if hydrogen could be stored as atoms and allowed to recombine in a rocket engine, a very high impulse rocket fuel would be attained. Stored in pure atomic form, the specific impulse of hydrogen would be more than 1,700 seconds. A mixture as little as 10% H (by weight) in H_2 would give a specific impulse of 650 seconds, compared to 475 seconds for the H_2-0_2 combination.

Several experiments are underway to produce and store atomic hydrogen mixtures. One that shows evidence of atomic hydrogen storage involves the freezing of a molecular hydrogen crystal containing a small amount (less than 0.1%) of tritium, a radioactive isotope of hydrogen. Energetic electrons from the decay of tritium breaks some molecular bonds, and some fraction of the resulting hydrogen atoms are expected to be trapped in the molecular lattice if the experiment is cooled to 1°K (−458F) or below. Energy storage does take place, because after some hours of radioactive decay at a temperature below 0.4°K (-458.95), the sample spontaneously heats up over 1°K, indicating the release of a quantity of stored energy. Measurements of magnetic properties infer that the storage of energy was due to atomic hydrogen.

Other experiments, in operation or nearly so, use electric discharges to create atomic-molecular hydrogen mixtures and strong magnetic fields and low temperatures to retain atomic hydrogen. The goal is to determine how to store as high a concentration of atomic hydrogen as possible to determine the feasibility of atomic hydrogen as an advanced rocket fuel.

Research on Superconducting Materials

In superconducting materials, electrical currents flow with zero resistance. Consequently, there is no loss of electrical energy during this flow. Also, some superconductors almost perfectly shield magnetic fields. These properties make superconducting materials useful for spaceborne instruments and in physics research. Furthermore, with no resistance, superconductors in power applications will increase efficiency and reduce sizes and costs of equipment such as motors, generators, and transmission lines. Superconducting magnets will also be needed in fusion power plants to confine the fusion plasmas.

NASA's research program studies many aspects of superconductivity. For example, the Marshall Space Flight Center uses superconducting materials and detectors as part of an ultra-sensitive gyro planned for space experiments in relativity. Powerful electromagnets made with super-conducting materials were designed at Lewis Research Center for use in research on high-temperature plasmas and other areas of physics. Researchers at the Jet Propulsion Laboratory, LERC and MSFC are attempting to find better superconducting materials, those that reach the zero-resistance state at higher temperatures, by research in the laboratory and in the zero-gravity environment in space.

The major difficulty with superconductors is the need to cool them to extremely low temperatures to reach the zero-resistance condition. A compound of niobium and tin, a widely-used material for this purpose, becomes a superconductor at a temperature of about 18 K (−427°F). To insure stable operation and for practical reasons, however, an operating temperature of 4°K (−453F) is usually provided by cooling with liquid helium.

Many of the difficulties in using superconductors could be eased if the operating temperature could be raised to only 20 K (−422F), the temperature of liquid hydrogen.

In 1973, Westinghouse Research Laboratories and Bell Telephone Laboratories announced that a compound of niobium and germanium (Nb_3Ge) was a superconductor at a temperature of 23 K (−418F). Clouding this promising discovery was the fact that the Bell and Westinghouse work was done with extremely thin films (less than one-tenth of a micrometer). Recently, technology developed some time ago by NASA and the Atomic Energy Commission in the nuclear rocket program was applied by the Los Alamos Scientific Laboratory to make 50-micrometer-thick films of Nb_3Ge, which is a useful thickness for carrying large amounts of current. Even in the thick samples of Nb_3Ge, superconducting conditions were reached at a temperature of 22 K (−420F). It is too early to tell where this research will lead; however, the prospects are good for a major breakthrough in superconducting technology with the Nb_3Ge metallic compound.

Some theoretical studies predict that a high-temperature metallic superconductor with an isotropic, three-dimensional structure will never be found. Researchers have, therefore, turned their efforts toward other material types with chain or layer structures, including multilayer thin films and organics, which have the promise, in theory, of high superconducting temperatures. A few weeks ago, a researcher at Stanford University supported by NASA achieved a superconducting condition in a polymeric material with a long-chain structure for the first time. Even though temperatures below 1 K were required, this important breakthrough may establish a concept leading to the long-sought-after goal of finding a material having zero-resistance to electrical current near room temperature. If this discovery can be confirmed and developed, we shall have the basis for making revolutionary impacts and improvements in basic science, power transmission, energy sources and conversion, computers, and many other facets of technology. □

Weinberger Cites Benefits of Satellite Communication

Sees Bright Future for Application of Space Technology to Medical and Educational Problems

A man with a facial infection was taken to a small clinic at Fort Yukon in Alaska. Satellite transmitting time was not available that day, so a nurse gave an audio description to a physician 200 miles away in Tanana, who prescribed penicillin. The next day, the nurse was able to present the patient visually on a television screen via satellite, and the doctor was able to see that the infection was worse and its drainage leading to the brain. The patient was immediately transferred to a medical center for care. The diagnosis by satellite had saved his life.

A baby girl was being treated in an outlying hospital in Alaska for recurrent fever, appetite loss and diarrhea. The hospital did not have the capability for satellite transmission, so she was taken to another where the facility did exist, and it revealed she had tuberculosis. Following treatment, she was returned to her village, and her condition is now monitored regularly via satellite.

Several obese and anemic children and their mothers in Fort Yukon were gathered at a nutrition clinic. There, via satellite, doctors in Anchorage were able to give them the type of care and counseling they needed.

These were actual incidents cited recently by Caspar W. Weinberger, Secretary of the Department of Health, Education and Welfare (HEW), in a discussion before the American Institute of Aeronautics and Astronautics in Washington of the benefits derived from applying space technology to problems on Earth.

His talk throughout revolved around the Applications Technology Satellite series, especially ATS-6, launched last May. He said HEW was particularly interested in those satellites that involve the delivery of educational and health services to isolated communities in the Rocky Mountain region, Appalachia and Alaska, and that it had invested more than $17 million as its share of the demonstration costs.

He reminded that ATS-6 is now on station in a fixed orbit 22,300 miles above the Equator and that, in May, it will be moved to a new orbit to provide a year of health and educational programming for the people of India.

"Judging from the first six months of its pioneering work for our own people," he said, "I am convinced that ATS-6 will make an historic advance in human communication and human progress."

Cost Important Factor

Despite its critics, he added, early evaluation would seem to indicate that basic objectives will be met. One of these is to use broadcast satellite technology with low-cost community receivers.

"Costs for receiving equipment and facilities are a major factor in whether communication can benefit people in areas where needs may be great but communities can least afford the expense."

He cited as the answer to this objective ATS-6, "the largest, most powerful communications satellite ever sent into space." He said that it has shown it can do more than any communications satellite which has come before. Its signals, he recalled, do not require the elaborate antennas that cost hundreds of thousands of dollars, but can be received by equipment costing less than $4,000.

"In fact," he reported, "receiver costs have been as much as 100 times lower than the cost of any previously available equipment capable of receiving television from a satellite.

"And at 106 sites in 20 States, from rural communities in the Rocky Mountain States to villages in Alaska, technical

Helping the Isolated—Here is an interior view of a Mobile Health Unit, a vehicle-type health facility that enables physicians to provide service to isolated villages on the Papago Indian Reservation in Arizona. Operated by the Johnson Space Center, it is part of a demonstration program utilizing space technology to bring improved health care to people in remote areas.

facilities have performed at, or above, the expected level while the costs of installing, maintaining and operating the equipment have been below estimates. That means that satellite programming can be received in a community at a cost that is less than the yearly salary of a school teacher or medical trainee. And thousands of people can benefit.

"Right now, about 5,000 people are involved in experimental groups using the education and health services made possible by ATS-6. And a much larger number of people, about two million, form a potential audience for viewing the programming via television broadcast from the 10 Public Broadcasting Service stations which have satellite receivers."

Confident of Future

After reviewing activities in the three areas now covered by ATS-6, he said: "While we could not be sure when we started that the technology of space could apply here at home, we can now see some of what it can do. And it is only a hint of what is possible.

"But that hint has been enough to prompt the formation of the Public Service Satellite Users Consortium—a national organization of health and educational organizations which they feel they can both use and pay for a special high-power satellite communication service. This represents the first attempt to form a sufficient market of small independent users to attract private investment capital for large-scale technology to meet their collective needs."

He told the AIAA members that the prospects for use of space-age technology now look so good that HEW is developing a strategy for Federal encouragement of a nationwide telecommunications system to meet the varied needs which the education and health communities, and other public and social services, determine for themselves. In fact, he added, the Tele-communications Facilities and Demonstration Act of 1974 will soon be resubmitted to Congress and will have the following objectives:

First, HEW's direct support for over-the-air educational radio and television broadcasting facilities would be extended for another five years.

Second, a telecommunications demonstration program would be established to encourage the development of commercial communications facilities and services to meet community needs for health and education.

"The legislation we are proposing," he concluded, "would foster the kind of multi-user telecommunications services and facilities that will enable health, education and medical service experimenters to develop jointly more efficient and economical ways to meet the nation's needs.

"We are truly living in a time when dreams can come true. First there was the restless dream of flight—an age-old dream even in legend. Then there was the daring dream of space. And today, the reality of these dreams has given us a new dream—a dream of being able to reach out to one another anywhere on this planet, where there is a human need."

Meeting Held to Discuss Transferring Space Technology to Gas Industry

About 200 gas industry technical managers and executives assembled at Lewis Research Center in Cleveland March 19 and 20 to review ways in which NASA-developed technology can aid the U.S. gas industry.

Dr. James C. Fletcher, NASA Administrator, was a featured speaker at the conference, which was part of NASA's continuing effort to insure that the American public, as well as U.S. industry, benefits to the fullest extent from the advanced technology resulting from the nation's space research and development investment.

The conference agenda was based on gas and energy-related aerospace technology selected by the Lewis Technology Utilization Office with the assistance of the Institute of Gas Technology of the American Gas Association.

The current energy crisis and the prospects for the future were reviewed, with special emphasis on the importance of synthetic fuels, uses of hydrogen, and conversion of organic materials as energy sources. Recent developments in advanced energy systems, such as the use of solar energy for heating and cooling, wind generators, modular integrated utility systems, and energy storage systems also were discussed.

Smylie Named Director for Space at LaRC

Robert E. Smylie, Deputy Associate Administrator (Space) for the Office of Aeronautics and Space Technology at Headquarters, has been named Director for Space at Langley Research Center and will assume his new position in July, replacing Eugene S. Love, who will retire.

At Langley, Smylie will direct research and development work in space systems, space applications and technology, environmental quality programs, and the Scout launch vehicle.

He has been in his present position at Headquarters since November, 1973. Before that, he was Chief of the Crew Systems Division at Johnson Space Center.

From 1962, when he came to NASA from the Douglas Aircraft Co. at Santa Monica, CA, until 1973, he worked in support of the Apollo Program, particularly in the fields of environmental and thermal controls, portable life support systems, bio-instrumentation, and water and waste management.

He recently was elected an Honorary Member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., in recognition of his work in the design, development, and test of the spacesuit and other portable life support equipment.

Landsat-2 Leads Ship Through Ice To New Supply Base in Antartica

Space satellites, Navy Antartica veterans and a tough Coast Guard ship and crew teamed up recently to aid the National Science Foundation (NSF) in reaching a heretofore inaccessible-by-sea area in Antartica by ship.

It was done for the first time by the Coast Guard cutter, *Burton Island*, guided by NASA's LANDSAT-2 satellite.

No such attempt had ever been made by sea. Even if a ship could get through, with only a six-week summer season, it could hardly make the trip and return before being ice-locked.

Before sending a ship into the area, NSF sought the opinion and support of the Navy's Fleet Weather Facility (FWF) at Suitland, MD, which has the responsility for weather forecasting for the Arctic and Antarctic.

FWF asked NASA if LANDSAT pictures could be provided within 24 to 36 hours after they are taken by the spacecraft. Imagery normally must go through a process that requires 14 days to get it into a user's hands. However, the Goddard Space Flight Center, which manages the LANDSAT program, agreed to supply the special service.

With the aid of LANDSAT photographs, which pointed out cracks in the ice, the Coast Guard cutter made the trip and returned without being frozen in by the quickly-returning winter season.

"We would never have backed a decision to go in without LANDSAT support," said Lt. Comdr. Joseph Ford of FWF. "If the ship got in serious trouble, we knew we could get her out before winter set in again by following the LANDSAT crack route. It provided the only way of getting out of that ice."

Flat Conductor Cable Meeting—James Hankins (standing) of Marshall Space Flight Center's Component Developing and Packaging Branch is pictured as he discussed the use of flat conductor cable, outgrowth of the space program, for home wiring and other applications at a recent meeting held there. Seated in order on his left are Dr. George M. Low, Deputy NASA Administrator, and Dr. James C.Fletcher, Administrator.

Starter of School Center Saluted as "Doer" at GSFC

The Goddard Space Flight Center is saluting Ann Merwarth, its Federal Women's Program Coordinator, as a "Doer".

This is in line with the International Women's Year agenda for 1975, which dedicates the month of April to "Doers," those women who, through their interest, motivation and courage, have been able to accomplish end results by working out a solution to a need. Mrs. Merwarth, fits into that category.

She saw the need for an educational day care center at GSFC that would operate on a full-day basis, rather than on a half-day basis as provided by other nursery programs.

Despite her full-time technical position as a mathematician in the Engineering Directorate, Electronics Systems Branch, and also as part-time Federal Women's Program Coordinator, she, a working mother with two children, began doing research in the area of preschool educational day care. After a year of this study, most of it done in her spare time, she was able to open the GSFC Child Development Center. The school is parent-run, with Ms. Merwarth as President of the Board of Directors.

Because of the interest of other government agencies in self-supporting educational full-day preschools on Federal property, she has written a paper entitled "A Place for Preschool Children," in which she describes the starting of a child development center. She also serves as a member of the Department of Labor Task Force of the Alliance of Federal Agencies on Day Care.

Ann Merwarth, solver of GSFC Child Center Need

Did You Know?

Dr. James C. Fletcher, NASA Administrator, said in a recent talk before the AIAA that, by 1985, the technology for fuel conservation can be developed to permit a 50 percent reduction in consumption by new aircraft, which will be less noisy and produce less pollution than that of today.

Testing of a spacesuit-type isolation garment began at Baylor College of Medicine in Houston, TX, during March. The garment would allow patients to carry a germ-free environment around with them for periods up to four hours and would be valuable in the care of immunity-deficient children who must be kept in a sterile environment.

It is predicted that there will be 10,000 payloads and pieces of fragmented spaceships, satellites, rockets, and other debris in orbit around the Earth by the year 2000.

A NASA scientist, Glen E. McDonald of the Lewis Research Center, has found that black chrome, once used for plating cameras and decorating objects, is about 20 percent more efficient than current coatings for solar collectors used in the heating and cooling of homes and buildings.

Water heated by the Sun's radiation is piped through baseboards for building heating or run through a spcial air conditioner for building cooling. System performance, McDonald discovered, can be substantially improved when the metal collector plate is coated with black chrome.

During the Apollo Soyuz Test Project (ASTP) this July, experiments will be conducted to find out if large, defect-free crystals can be grown in space. If so, they will be used on Earth in the semiconductor electronics industry to improve radio, television and other forms of communications. Tests conducted during Skylab indicate that space-grown crystals are superior to those grown on the ground.

Fifteen years ago, on April 1, 1960, NASA placed in orbit the first weather satellite, launching it from Cape Canaveral, FL. Called TIROS-1 (for Television Infrared Observation Satellite), it is the ancestor of a long and distinguished line of spacecraft descendants.

Currently 31,000 contractor workers in 47 states are busy on the development of the Space Shuttle. The number is expected to reach 34,000 by June of this year and 50,000 within the next two years.

A change in the transportation system put into effect at the Johnson Space Center last December because of the national energy shortage is expected to save 30,000 gallons of gasoline annually. It revolves around two shuttle buses which travel in opposite directions around the installation.

During the next two years, the nation will spend $21 million to encourage builders to develop solar heat for new homes. The money will be used to erect as many as 1,000 houses to prove the technology of solar heating and to "retrofit" some homes now using conventional heating methods.□

Harnessing Wind Energy—This is a model of a 100-kilowatt windmill that will be built and tested by Lewis Research Center. A forerunner of much larger systems which could help supply a portion of the nation's total electric power needs, it is being developed as part of the NASA-National Science Foundation Solar Energy Program. As presently envisioned, it will have a tower 125 feet tall and rotor blades 125 feet from tip to tip. The horizontal cylinder to which the latter are attached will contain the power transmissions and controls systems.

Dr. Clark Co-Winner of Collier Trophy

Dr. John F. Clark

Daniel J. Fink

Dr. John F. Clark, Director of the Goddard Space Flight Center, and Daniel J. Fink, Vice President of General Electric's Space Division, have been designated to receive the National Aeronautics Association's (NAA) Robert J. Collier Trophy for their individual accomplishments in making LANDSAT, the Earth Resources Technology Satellite Program, the outstanding aerospace event of 1974

Choice of the LANDSAT Program was unanimous. In honoring the two officials as representing the NASA/Industry Team "which abundantly proved during 1974 the value of remote sensing to space," the Selection Committee also paid particular tribute to Hughes Aircraft's Space and Communications Group and RCA's Government and Commercial Systems for their respective roles in the resources and environmental surveys accomplished by LANDSAT.

The trophy is traditionally presented on behalf of NAA by the President or Vice President of the United States. This year's presentation will take place in Washington on May 2 at a dinner given jointly by NAA and the National Aviation Club.

Established in 1912 by Robert J. Collier, publisher and pioneer aviation enthusiast, the trophy may be awarded to an individual, a group of individuals, or to an organization. It is presented specifically "for the greatest achievement in aeronautics or astronautics in America, with respect to improving the performance, efficiency or safety of air or space vehicles, the value of which has been thoroughly demonstrated by actual use during the preceding year."

Recipients in recent years from NASA have included the Apollo 8, 12 and 15 crews and the Skylab Program, with special recognition to its Director, William C. Schneider.

Mariner 10 Exhausts Fuel After Long Run in Space

Satellite Compiles List of "Firsts' Before Going into Orbit Around Sun

Mariner 10, the spacecraft that refused to quit, has finally been put out to pasture after more than 16 months of sailing among the stars.

Its fuel supply exhausted after traveling nearly a billion miles in space, Mariner now will spend infinity in honorable retirement, perpetually orbiting the Sun in giant loops.

Mariner 10 leaves behind a legacy that includes:

- The first satellite to perform four planetary encounters during a single mission—one to Venus and three to Mercury.
- The first to use the gravity of one planet (Venus) to reach another (Mercury), a technique which permits the use of smaller, less expensive rockets for launching.
- The closest pictures ever taken of another primary planet.
- New information on planetary magnetic fields that may provide further clues to the origin and early history of our solar system.

The incredible saga of Mariner 10 began on Nov. 3, 1973, when the spacecraft was launched toward Venus from Cape Canaveral, FL. In February of last year, Mariner 10 flew within 3,600 miles of Venus and radioed back the first close-up pictures ever taken of that cloud-shrouded planet. Then, gaining energy from the gravity of Venus, Mariner sped toward Mercury. On March 29, 1974, and again last Sept. 21, Mariner 10 executed photographic missions. For the first time, sharp pictures of a large part of Mercury's surface were available.

Last month, the space robot ended its third and last mission on a dramatic note as it flew on a near collision course with the planet so that it could get close enough to study Mercury's mysterious magnetic field, discovered on the first encounter.

Skimming over the Sun-scorched planet at a distance of 327 kilometers (203 miles), Mariner's instruments confirmed the earlier finding: The planet does indeed have an intrinsic magnetic field. The discovery settled one question, and now raises another: Why does Mercury have a magnetic field?

On paper, Mercury shouldn't have a magnetic field at all. The only planets known for sure to have such fields in the solar system are Earth and Jupiter. Mercury is too small, according to theory, and it doesn't spin fast enough (one rotation every 59 days).

The origin of the field could give important clues on the beginnings of Mercury and provide valuable information on the source of Earth's own magnetic field—a phenomenon still not clearly understood.

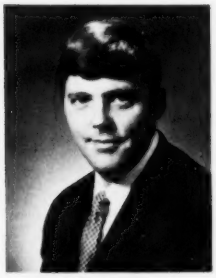
Since its launch in 1973, Mariner experienced — and overcame — numerous technical problems, from gas leaks

to overheating. And, in fact, many scientists expressed surprise that the spacecraft was still able to obtain data and take photographs on its last mission.

True to character, Mariner provided flight controllers at NASA's Jet Propulsion Laboratory with a cliffhanger even as it approached Mercury for its last encounter. Controllers had difficulty in establishing contact with the craft and pointing it in the direction desired for the magnetic readings and pictures.

The problem was made more difficult by the tandem demands on the capabilities of the giant dishlike NASA antennas that are located in California, Australia and Spain to track deep space probes.

Primary users of the antennas at the time were German scientists who were tracking Helios-1, an American-German spacecraft designed to study the Sun. Helios was reaching its closest point to the Sun, 28 million miles, at the same time that Mariner was having its difficulties. To save Mariner, the Germans were asked to surrender some receiving time on the antennas to solve the problems with Mariner. Even though this was the time of maximum scientific interest for the Germans in the readings from instruments aboard the Helios, they acceded.



Dr. James A. Dunne

Dr. Norman Ness

"And they wished us good luck with Mariner," Dr. James A. Dunne, JPL Project Scientist, told a press gathering.

In congratulating flight controllers at the Jet Propulsion Laboratory and at the Boeing Company for their success in bringing in the weary spacecraft to its third flight past Mercury, Dr. Norman Ness of Goddard Space Flight Center said: "With this mission, technology was pushed to its very limit."

The New York Times, in an editorial entitled "Mariner 10", put it this way:

"In a world where so much that is manufactured is shoddy, faulty in conception or the end result of workers who could not care less, it is worth remembering that men can also build durable, reliable and trustworthy mechanisms whose historic contribution to knowledge has substantially enhanced man's understanding of the solar system."

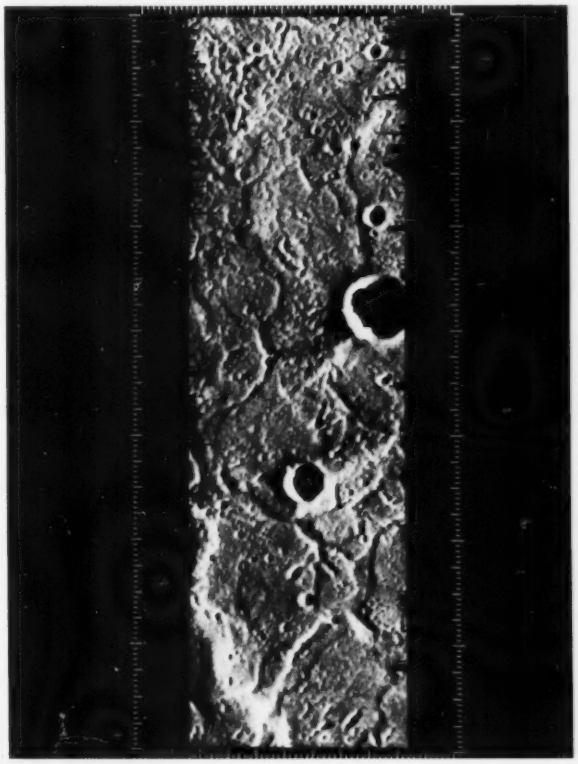
On March 24, the break between Earthlings and the space robot became final. The command was sent to the spacecraft to turn off its transmitter; radio signals from the craft ceased. "We have pulled the plug," said a flight controller at JPL.

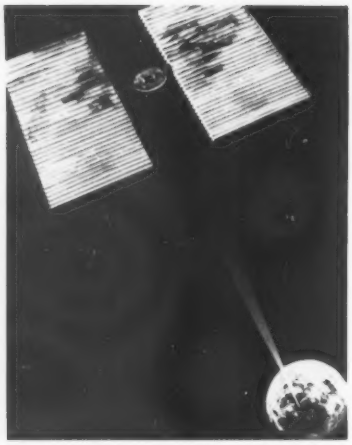
Mariner 10's last official act before sweeping into history was to lend itself to a series of engineering tests to provide data for future spacecraft design.

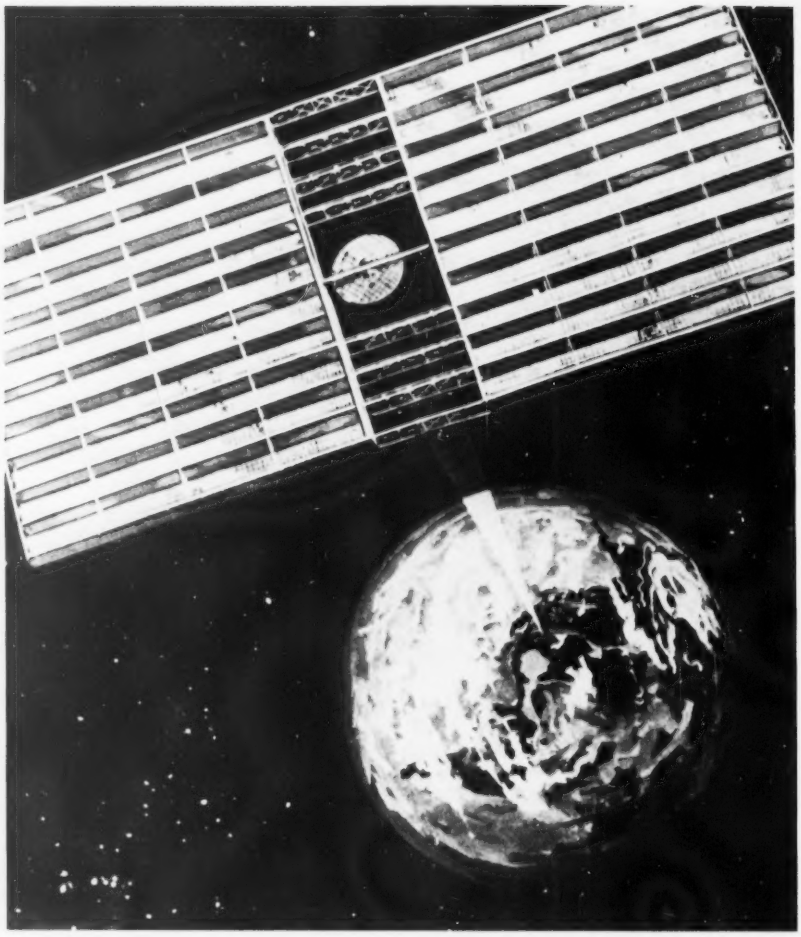
The Mariner 10 team included Earl Glahn, Program Manager, who succeeded N. William Cunningham; Stephen E. Dwornik, Program Scientist; Guenter Strobel, Program Engineer, all of NASA Headquarters; Robert J. Parks, Acting Project Manager, who succeeded Walker E. (Gene) Giberson, and Dr. Dunne, Project Scientist, all of JPL.

A commemorative stamp honoring Mariner 10 was issued by the U.S. Postal Service on April 4 at ceremonies at JPL.

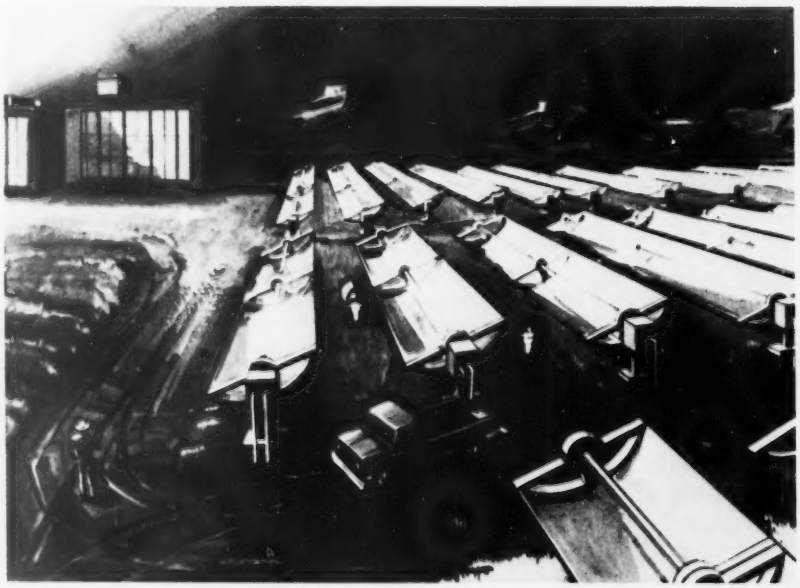
FRACTURED PLAINS OF MERCURY — This high resolution glimpse of the fractured plains of Caloris Basin on Mercury was obtained by Mariner 10 at a distance of 19,000 kilometers (11,800 miles), 34 minutes after the spacecraft swept past the planet for the third and final time.







The Search for Electricity Sources—The two artist's concepts shown above are of solar satellite power stations comprising one of several methods under study at Lewis Research Center to generate large amounts of electric power for uses on Earth. Placed at synchronous altitudes, the stations would convert the Sun's radiation into electricity by large solar arrays. The energy thus formed would then be transformed to microwaves and transmitted to Earth, where receiving stations would reconvert them into electricity. At left is a model of how collectors covering 60 square miles of a desert theoretically could provide all U.S. electrical needs in 1985. This idea also is undergoing tests at LERC.



New Office of Safety and Health Announced by Groo

E. S. Groo, Associate Administrator for Center Operations, has announced establishment of the Office of Safety and Environmental Health in the Office of Center Operations.

The new office, reporting to the Assistant Associate Administrator for Center Operations (Systems Management), Raymond A. Kline, will have agency-wide functional responsibility for all safety matters, except systems safety, and for environmental health. It will also serve as the agency focal point for coordination on policy and program matters pertaining to the Occupational Safety and Health Act of 1970, and will assume the environmental health functions formerly assigned to the Office of Occupational Medicine and Environmental Health.

Reuben P. Prichard, formerly Director of the Safety Division in the Office of Safety and Reliability and Quality Assurance, which was abolished effective March 15, 1975, will serve as Acting Director of the new office, to which personnel performing institutional safety and environmental health functions in the Safety and Reliability and Quality Assurance Office and the Office of Occupational Medicine.

Space Vehicle Panel Meets

The semi-annual meeting of the Panel on Space Vehicles of the Research and Technology Advisory Council, Office of Aeronautics and Space Technology, met at the Marshall Space Flight Center in its semi-annual session during March.

The meeting was open to the public. It featured such topics as Space Shuttle vehicle dynamics, Shuttle main propulsion, and Shuttle-747 transportation vehicle separation.

The nine-member panel, comprised of aerospace executives and members of university staffs, serves NASA in an advisory capacity.

James Rowe to Head KSC Executive Staff

James R. Rowe, a registered professional engineer, has been appointed Chief of the Executive Staff at the Kennedy Space Center by Director Lee R. Scherer.

In this position, Rowe will provide staff assistance to the KSC Director and Deputy Director and provide the Center's single point of contact in Congressional liaison affairs.

A graduate of the University of Georgia, Rowe first was employed at KSC as a project engineer in the Facilities Division in August, 1963, later serving as a special assistant to the Director of Design Engineering. In December, 1966, he joined the KSC Executive Staff.

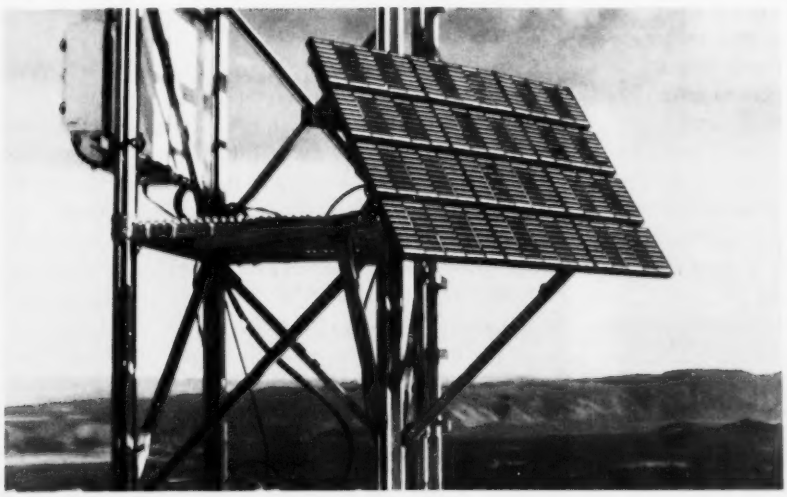
NASA Makes Lunar Samples Available to U.S. Schools

Under a new NASA program, lunar samples from three general types of rock found on the Moon—plutonic, volcanic and breccias—are now available on a loan basis to colleges and universities of the U.S. offering undergraduate or graduate work in the geosciences.

The packages of material, which may be used for teaching purposes for up to several months, also will include samples of lunar soil, which consists of ground-up rock and various glasses formed by fusion and rapid meteoric heating. Each sample will be fully identified.

The aim of the program is to broaden the use of the lunar sample collection for scientific and educational purposes and to provide the samples as an educational tool. There is no cost to the institutions. The only equipment needed in the study is a standard petrographic microscope.

Application should be made to the Lunar Sample Curator, Code TL, Johnson Space Center, Houston, TX 77058. Qualifying institutions must enter into a cooperative agreement with NASA which outlines security conditions for the safekeeping of the lunar material.



Protection Against Hostile Elements—The weather station shown here atop Mammoth Mountain in California is operated by the National Weather Service and is powered by silicon solar cells encapsulated in a plastic which serves as protection against harsh weather. Based on designs developed at Lewis Research Center for space application, the cells make it unnecessary to refuel a station or replace its batteries. Over the next 10 years, about 1,100 of the stations will compromise a nationwide meteorological network, many of them in remote locations where weather conditions are hostile.

President Ford Hails Impact of 15 Years of Weather Satellites

In recognition of the passage of the 15th year since NASA on April 1, 1960, launched the Television Infrared Observation Satellite-1 (TIROS-1), this nation's first weather satellite, President Ford issued the following statement from the White House:

"The 15th anniversary of the first meteorological satellite, TIROS-1, gives me a welcome opportunity to express my appreciation for the achievements of the nation's weather satellite team in NASA, NOAA (National Oceanic and Atmospheric Administration) and industry. I am sure that all Americans share in this sentiment.

"More accurate daily weather forecasts, as well as early warning of deadly and destructive storms that once could sweep in from the sea unannounced, have had an immeasurable impact in making the lives of millions more pleasant, productive and secure.

"No major storm anywhere in the world goes undetected by NASA or NOAA satellites. We can be proud that people everywhere can benefit from this practical application of U.S. space science and technology."

Self-Evaluation Process by NASA Is Declared a Success

Dr. Jenkins Says Avenues Suggested for Significant Follow-up on Initiatives

NASA's first attempt at "self-evaluation" of its performance in Equal Opportunity (EO) programs, a procedure conducted last November, December and January in compliance with U.S. Civil Service regulations, has been declared a success.

This assessment was given by Dr. Harriett G. Jenkins, NASA's Assistant Administrator for Equal Opportunity Programs, who said the self-evaluation process "provided a rich opportunity for the involvement of a broad cross section of NASA employees" and suggests avenues for significant follow-up on the initiatives already begun.

The objectives of the self-evaluation were to raise awareness of all managers, supervisors and Center employees; to set numberical goals for hiring, promoting and training minority and female employees; and to evolve affirmative actions which would help each Center meet those objectives.

NASA has indicated its intent to meet or exceed all numerical employment goals established in the self-evaluation process for the period January through June of this year, as well as for the entire fiscal year of 1976. In addition, discussions concerning the goal achievements and affirmative actions will be continued under the Work Planning and Progress Review with individuals in all levels of the organization.

The self-evaluation process was initiated by the Office of Equal Opportunity Programs, in collaboration with Madison Smith, former Deputy Director of Personnel, and extended to all segments of the NASA population. Results are now being reviewed and will be reported to Center management.

The NASA EO Council, which at that time was composed of Deputy Center Directors, four non-supervisory employees from various Centers and representatives from the agency EO Office, played a big part in assuring that Center management clearly understood the importance and purpose of the plan.

Center management was given the task of notifying employees of the nature and purpose of the plan and outlining the manner in which it would be implemented. Top Center management also received and evaluated the data that came from all levels of supervisors and employees, and established which actions would be taken to achieve the installation's goals.

The Center Deputy Director had the responsibility of planning and monitoring the self-evaluation activities, organizing the information gathered, and participating in evaluating the data. Most of the data came from two sources—supervisors and employees.

Supervisors did a people inventory of the workforce for which they were accountable in 1973; what their opportunities for hiring, promoting and training would be in 1975 and 1976, set numerical goals, and established affirmative actions for meeting those goals.

Employee constituent groups identified strengths and weaknesses of the EO program and made suggestions for achieving EO objectives. These groups were established to facilitate employee input in the self-evaluation process and were composed of 10 or fewer Blacks, Spanish-speaking, American Indians, Orientals, women, supervisors, EO counselors, non-minority males, and a heterogeneous cross section. At the end of their meetings, each participant was given a questionnaire on the Center's EO counseling program to be filled out and mailed to the agency office of Equal Opportunity Programs.

NASA has in the past been criticized for trailing most other Federal agencies in equalizing opportunities for all its employees. The agency's exploits in setting and achieving space exploration goals are well known and documented. NASA now faces and has accepted the challenge to make its equal opportunity efforts reach the same heights of excellence that have been achieved in its space missions. Its top management believes that significantly improved performance in the area of EO Programs is essential to the vitality and credibility of the agency.

The ultimate goal is to eliminate all discrimination within the agency in fact or appearance. This can be accomplished, it is pointed out, only if there is equal opportunity, regardless of race, color, sex, nationality, religion, or age, for employment, for promotion, and for sharing in NASA's contracts, grants and missions.

In the past, NASA has been evaluated by outside forces, including the Civil Service Commission, the General Accounting Office and Congressional committees. This self-evaluation process gave NASA an opportunity to look at itself, to assess its progress to date, and to set goals for the near future.

Maryland Community Selected For Solar Heat Demonstration

GSFC Participates in Joint Project to Cut Home Fuel Costs

Owing to the nearness of Goddard Space Flight Center, which has had years of experience in designing and employing solar energy systems for flight projects, the idea of using solar heat to conserve fuel in family dwellings will have an actual demonstration next winter in Maryland's 1,600-home community of Greenbelt.

Such a project was formulated recently with the signing of an agreement by Dr. James W. Smith, President of Greenbelt Homes, Inc., and Dr. John F. Clark, GSFC's Director.

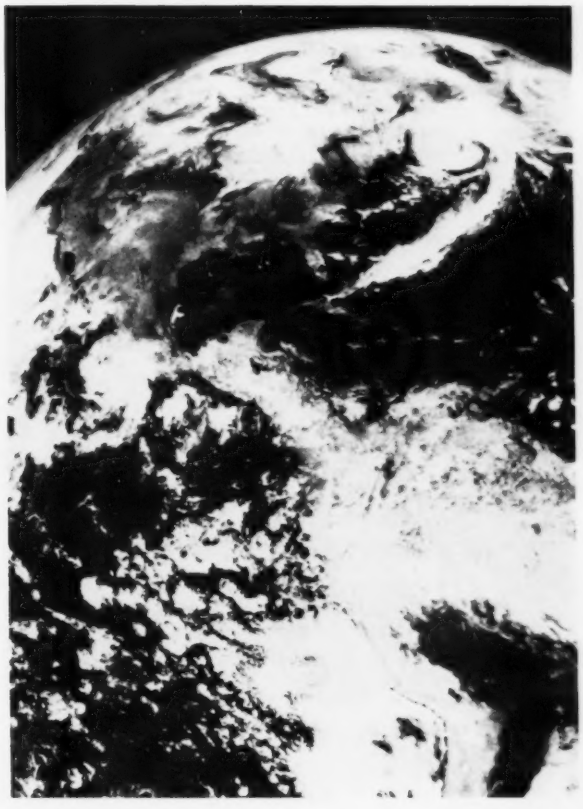
In the first phase of the project, for purposes of comparison, two of four Greenbelt apartment buildings, each housing four families, will be fully insulated and instrumented to measure heat loss and fuel consumption, while the others will not be so equipped.

The second phase, based on the cost effectiveness demonstrated during the first phase, will involve installation of solar heating units designed to augment existing hot water radiator systems.

Emil Hymowitz, Goddard's Project Manager for the Greenbelt effort, estimates that solar heating systems used to augment the existing heating units could save as much as 50 percent of home fuel costs. This estimate is based on preliminary analysis of the existing structures.

Greenbelt is one of three towns built by the U.S. Government in the 1930s as an experiment in new communities founded upon sound environmental concepts. Its design for years has attracted the attention and praise of community planning experts from around the world.

What 15 Years Can Do—On April 1, 1960, the first weather satellite, TIROS-1, was placed in orbit from Cape Canaveral. The latest addition to the weather satellite family is the Synchronous Meteorological Satellite (SMS). Pictured on left is one of the first TIROS-1 photos of Florida, while at right is a recent SMS-2 photograph of the continental U.S.



Naugle Speaks on Space Program at FASST/White House Youth Conference

Dr. John Naugle, Deputy Associate Adminstrator of NASA, addressed 18 members of the Federation of Americans Supporting Science and Technology (FASST) at a meeting on "Youth and Technology" at the White House March 5. The session marked the first student participation at the bi-weekly Wednesday White House discussions.

Dr. Naugle presented a summary of the future plans of NASA, including the LANDSAT program, the Viking Mars mission, the Apollo Soyuz Test Project and the Space Shuttle development program. His presentation was followed by a question-and-answer period.

Also participating were officials from the Department of State, Department of Health, Education and Welfare, the Energy Research Development Agency and the Domestic Council.

FASST is a non-profit, nationwide organization that seeks increased communication between students, industry and government. It is divided into several councils, including Energy/Environmental, Biomedical and an Aerospace Youth Council, in the last of which the largest portion of the membership is participating.

White House Meeting—Dr. John E. Naugle, NASA Deputy Associate Administrator, is shown as he discussed the space program before members of the Federation of Americans Supporting Science and Technology (FASST) at the White House.

Photo by Billie B. Shaddix

Keeping It Cool—Technology used to design protective suits for Apollo and Skylab astronauts has been employed in commercial development of a self-contained cool suit, such as this, to enable an individual to work in areas of extreme heat for extended periods of time. Ordinary tap water, placed in a cooling bag with ice cubes, is pumped by a battery-operated unit through the channeled vest and cap to cool the wearer's body and head. The suit can be worn over work clothes and adjusted to size.

Soviet Scientist Visits MSFC

A scientist from the Soviet Union visited the Marshall Space Flight Center during March in connection with a joint experiment to be conducted during the USA-USSR Apollo Soyuz Test Project (ASTP) mission in July.

This scientist, Yuriy S. Malkov, spent several days witnessing ground-based testing of the Multiple Metals Melting experiment for processing three different materials in a Multipurpose Furnace.

The ASTP space processing experiments are designed to obtain knowledge of the effects of gravity and convection in the solidification of materials. This knowledge may then be applied to improving materials processing techniques on Earth, as well as leading to manufacturing superior materials in space for use on Earth.

Laser Technique May Bare Subsurface Water Qualities

What goes on beneath a sea's surface, now open to study only by expensive and slow on-site sensors, may soon be bared by a laser technique now under development through a NASA contract awarded the University of Miami by the Kennedy Space Center.

The new technique, proved feasible during a nine-month study by the University, appears to have the potential of becoming a useful tool with which to monitor temperature, turbidity, salinity and other factors affecting subsurface water qualities quickly and cheaply. It should be effective in both fresh and salt water bodies.

Initially, perhaps by January, 1976, the technique will be applied from a ship, but later it may be carried out from an aircraft or a satellite.

A laser is an electronic device that emits an extremely intense beam of energy in the form of light rays. Its ability to penetrate deeply into water is derived from the unique nature of the beam. The aim is to develop the device so that it can penetrate water to a depth of 100 meters (328 feet).

REPLACING Saturn IB Fins—All eight fins of the Saturn IB vehicle for the Apollo Soyuz Test Project mission in July were replaced during March after tiny cracks caused by stress corrosion were discovered. Here, as shown, the replacement fins were modified and then tested at the Marshall Space Flight Center before they were put in position at the Kennedy Space Center.

Hollinshead Named Chief of KSC Public Affairs

Charles T. Hollinshead, formerly Chief of the Public Information Branch at the Kennedy Space Center, has been appointed Chief of Public Affairs there.

Hollinshead had been serving in his new post in an acting capacity since the retirement last December of Gordon L. Harris, the Center's first and only other Public Affairs Chief.

After serving in the U.S. Navy as a pilot from 1954 to 1958, Hollinshead was employed for five years by the Martin Marietta Corp. at Orlando, FL. He came to KSC in 1963 as a publications writer and joined the public affairs staff the following year.

LAGEOS Hardware Inspected

Visual inspection of the actual flight hardware was a highlight of the acceptance review of the Laser Geodynamic Satellite (LAGEOS) project held at the Marshall Space Flight Center recently.

The meeting was attended by personnel from Goddard and Marshall Space Flight Centers, Headquarters, the McDonnell Douglas Corp.'s Western Division, and scientific advisors from the Smithsonian Astrophysical Observatory.

LAGEOS, scheduled for launch in early 1976, will weigh approximately 411 kilograms (903 pounds) and use laser satellite tracking techniques to make accurate determinations of the Earth's crustal and rotational motions.

One possible benefit expected to result from acquiring information on these crustal and rotational motions is the development of techniques for predicting earthquakes.

2 New Directors Named at LaRC

Appointment of Richard R. Heldenfels as Director of Structures and James E. Stitt as Director for Electronics at the Langley Research Center, positions in which both have been serving on an acting basis since January, has been announced by Dr. Edgar M. Cortright, Director.

In his new office, Heldenfels, who came to Langley in 1947, will manage research and development work in acoustics and noise reduction, materials, structures, loads, dynamics and aeroelasticity, and special programs in computer-aided design and composite structures for aircraft and space vehicles.

Stitt, who also has been at Langley since 1947, will manage aeronautics and space research work in analysis and computations, flight dynamics and control systems, instrument research, flight instrumentation and the Terminal Configured Vehicle Program.

Radio-Television

(Released Nationally)

Television—A two-part color film release in the *Aeronautics and Space Report* series: "Vortices Research," (FRC/Dave Scott); and "SMS/TIROS."
Radio—Five weekly *Space Story* programs have been released: "Viking to Mars," (JPL/Norris); "Reusable Shuttle Progress," (JSC/Thompson); "Firefighters' Breathing Apparatus," (JSC/McLaughlin); "ASTP Experiments," (Rockwell Int'l/Larson); and "Earth Resources Programs," (JSC/Smith). One monthly NASA *Special Report*, "Manned Space Flight Prospectus," (JSC/Dr. Christopher Kraft).

New NASA Publication

Mars as Viewed by Mariner 9 is a 225-page book of high and low resolution pictures, as well as relief maps, of the planet's surface. The giant volcanoes, mysterious canyons, channels, and other features are clearly shown and described by the Mariner 9 Television Team and the Planetary Program Principal Investigators. So, too, are polar regions, plains, clouds, natural satellites, and enigmas. Similarities between Mars, the Earth and the Moon also are noted. Copies may be obtained for $8.15 each from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. (SP-329)

Lunar Sample Exhibits

The following is a schedule of lunar sample exhibits from April 15 to May 15, 1975:

Michigan—Lake Superior State College, Sault Ste. Marie, April 20–21.
New Jersey—Friends School Gem & Mineral Show, Mullica Hill, April 16–21.
South Carolina—Space Science Education Emphasis Week, April 28–May 2.
Tennessee—Spring Festival, Kingsport, April 19–27.
Texas—Houston Museum of Natural Science/History, End of Caroline at Hermann Park, Houston, April 15–May 15.

Long Term Displays

Alabama—Alabama Space & Rocket Center, Marshall Space Flight Center, Huntsville.
Florida—Visitor Information Center, Kennedy Space Center.
Kansas—Eisenhower Library, 200 SE 4th Street, Abilene.
New York—United Nations Building, New York City.
Ohio—U.S.A.F. Museum, Wright Patterson AFB.
Texas—Johnson Library, University of Texas, Austin; Visitor Information Center, Johnson Space Center, Houston.
Virginia—Visitor Information Center, Langley Research Center, Hampton.
Washington, DC—National Geographic Museum; Smithsonian Institution, National Air and Space Museum, 1000 Jefferson Drive; Washington National Cathedral.

Film Activity

"Who's Out There?"—Orson Welles is the host and star of an extraordinary half-hour film. A number of distinguished scientists conclude that there is some one out there, in outer space.

From the monstrous Mars life forms of his famous 1958 radio broadcast, "The War of the Worlds," Orson Welles takes us through science fiction to science fact—to the new view of extraterrestrial life now emerging from probes to the planets—to interstellar discoveries in findings about the nature of life itself. The film is a portrayal of a contemporary scientific conclusion that there exists intelligent civilizations in the universe—a real picture as astonishing as any science fiction.

Headquarters Press Releases

(Issued by the Public Information Division, Code FP, Headquarters, Washington, DC 20546. These releases are available only to members of the news media.)

75-48 Technology Essential to World Leadership
75-49 Jovian Magnetic Field Is Complex, Pioneer 11 Shows
75-50 Two Saturn IB Fins to Be Replaced
75-51 NASA Resumes Flight Investigation of Air Turbulence
75-52 Sixth Lunar Science Conference Set at Houston
75-53 Zaire to Build First African LANDSAT Ground Station
75-54 Useful Pictures from Space Available
75-55 Black Chrome Coating More Efficient for Solar Collectors
75-56 NASA Future Programs
75-57 All Eight Saturn IB Fins to Be Replaced
75-58 Mariner Making Last Visit to a Small Planet
75-59 Mariner 10 Third Mercury Encounter Press Kit
75-60 Second Commercial Aircraft Begins Pollution Survey
75-61 Effects of Long-term Space Flight Object of ASTP Medical Experiments
75-62 Crystals to Be Grown in Space During ASTP Mission
75-63 More than 30,000 Persons at Work on Space Shuttle
75-64 Note to Editors: Correction in 75-53
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Patents for Inventions Resulting from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel for the indicated installation.

Inventor(s) and Employer	Title and NASA Docket	Patent No.	Installation
Bruce A. Banks, NASA/LeRC	Method of Making Dished Ion Thruster Grids (LEW-11,694-1)	3,864,797	LeRC
John B. Hall, Jr., and Edwin F. Williams, NASA/LaRC	Automatic Liquid Inventory Collecting and Dispensing Unit (LAR-11,071-1)	3,864,060	LaRC
George P. Kazokas, McDonnell Douglas Corp., Huntington, CA	Vacuum Leak Detector (LAR-11,237-1)	3,864,960	LaRC
Donald C. Lokerson and Ronald E. Boston, NASA/GSFC	X-Y Alphanumeric Character Generator for Oscilloscopes (GSC-11,582-1)	3,866,210	GSFC
Reed S. Lindsey, Jr., Lockheed Electronics Co., Inc., Houston, TX	Random Pulse Generator (MSC-14,131-1)	3,866,128	JSC
Robert F. Dillon, Jr., Robert C. Mayne, Caltech/JPL, Pasadena, CA	Shock Absorbing Mount for Electrical Components (NPO-13,253-1)	3,863,881	NaPO
James E. Johnston, NASA/MSFC	Electrostatic Measurement System (MFS-22,129-1)	3,866,114	MSFC
George V. Buhler, Dale E. Havens, McDonnell Douglas Corp., Huntington Beach, CA	Meter for Use in Detecting Tension in Straps Having Predetermined Elastic Characteristics (MFS-22,189-1)	3,864,953	MSFC
Philip A. Studer, NASA/GSFC	Magnetic Bearing (GSC-11,079-1)	3,865,442	GSFC
Joseph Maserjian, Caltech/JPL, Pasadena, CA.	Deep Trap, Laser Activated Image Converting System (NPO-13,131-1)	3,865,975	NaPO
Marvin Perlman, William J. Rousey, Alan Messner, Caltech/JPL, Pasadena, CA	System for Generating Timeing and Control Signals (NPO-13,125-1)	3,866,022	NaPO
Richard F. Schmidt, NASA/GSFC	Dish Antenna Having Switchtable Beamwidth (GSC-11,760-1)	3,866,233	GSFC
George L. von Pragenau, NASA/MSFC	Space Vehicle (MFS-22,734-1)	3,866,863	MSFC
Peter B. Mumola and Belton T. McAlexander, NASA/LaRC	Laser Head for Simultaneous Optical Pumping of Several Dye Lasers (LAR-11,341-1)	3,868,591	LaRC
Rindge Shima, Caltech/JPL, Pasadena, CA	Multitarget Sequential Sputtering Apparatus (NPO-13,345-1)	3,864,239	NaPO
John J. Daeges, Caltech/JPL	Motor Run-up System (NPO-13,374-1)	3,867,677	NaPO
William F. Iceland and Edwin L. Wiffen, North American Rockwell Corp., Downey, CA	Grain Refinement Control in Tig ARC Welding (MSC-19,095-1)	3,864,542	JSC

Waiver of Patent Rights

During the period of July through December, 1974, the Inventions and Contributions Board recommended that waiver of patent rights to inventions be granted to the NASA contractor organizations listed below. The Administrator of NASA subsequently reviewed the recommendations and granted the waivers. The grant of waiver gives a petitioner for patent waiver exclusive rights to commercialize an invention for the ultimate use of the general public while reserving to the government free use of the invention.

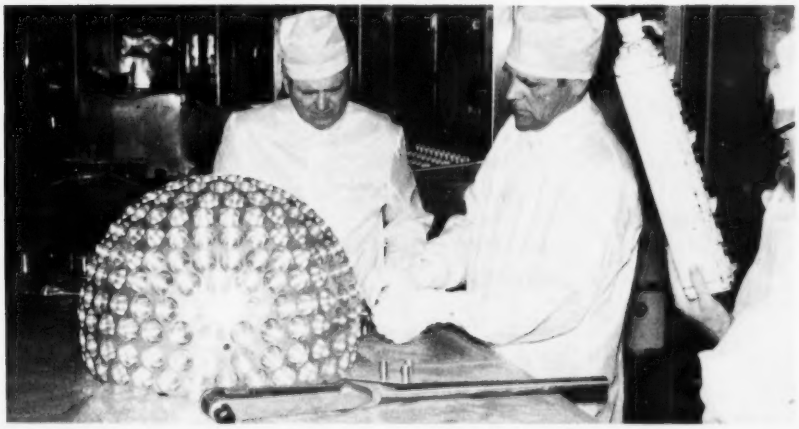
Petitioner	Title of Invention
Aerotherm Acurex Corp.	Head Cooling Device
California Institute of Technology	Hydrogen Bromine-Secondary Battery
Do.	Zinc Halide Battery with Molten Electrolyte
Do.	Wide Bend Digital Pseudo-Gaussian Noise Generator
Do.	Small, Porous, Polycrylate Beads
Do.	Treatment of Surfaces to Stimulate Biological Cell Adhesion and Growth
Cambridge Thermionic Corp.	Virtually Zero-Powered Magnetic Suspension
Martin Marietta Corp.	Overwrapped Pressure Vessel
Massachusetts Institute of Technology	Semiconductor Sensor
Rockwell International Corp.	Spoiler Layers for Capacitance Reduction in Ferroelectronic Display Devices
Do.	Low Power Operating Circuit
Stanford Research	Tactile Sensing End Effector Tongs
TRW, Incorporated	Combustor
University of Wisconsin	Neuristor R-Junction

Projected Launch Schedule

(As of March 24, 1975)

Name	Launch Date	Vehicle	Range	Mission Remarks
GEOS–C	April	Delta	WTR	Oceanographic and geodetic satellite to measure ocean topography, sea state, and other features of the Earth.
Telesat-C	April 9	Delta	ETR	Third in a series of Canadian Communications satellites to provide television, voice, data and other communications throughout Canada. Reimbursable.
Marisat–A	April	Delta	ETR	Comsat Corp, satellite to provide maritime satellite communications service. Reimbursable.
SAS–C	May 7	Scout	SM	Third in a series of small astronomy satellites to survey the celestial sphere and search for sources radiating in the X-ray, gamma ray, ultra-violet and other spectral regions both inside and outside our galaxy.
Intelsat IV F1	May	A-Centaur	ETR	Continuation of Intelsat series of synchronous satellites providing commercial global telecommunications service to members of the International Telecommunications Satellite Consortium. Reimbursable.
OSO–I	May	Delta	ETR	Scientific satellite to investigate a variety of specific features of the Sun.
Nimbus–F	May	Delta	WTR	Experimental meteorological satellite to test instruments for expanding capabilities for remote sensing of the atmosphere.
ASTP	July 15	Saturn 1B	ETR	The U.S. launch for the U.S.-Soviet manned space flight. American astronauts in an Apollo Spacecraft will rendezvous and dock with Soviet cosmonauts in an orbiting Russian Soyuz spacecraft to test a new universal docking system and to conduct joint and unilateral experiments.
ESRO-COS-B	3rd qtr.	Delta	WTR	European scientific satellite to study extraterrestrial gamma radiation. Reimbursable.
ITOS–E2	July	Delta	WTR	Operational meteorological satellite of the National Weather Service to provide day and night cloud cover imagery. Reimbursable.
Symphonie-B	3rd.Qtr.	Delta	ETR	Second joint French/German experimental communications satellite designed for TV, telephone, and data transmission. Reimbursable.
Viking-A	3rd Qtr.	TIII-Centaur	ETR	Planetary mission to explore Mars from orbit around the planet with a capsule on its surface.
Viking-B	3rd Qtr.	TIII-Centaur	ETR	Planetary mission to explore Mars from orbit around the planet with a capsule on its surface.
Marisat–B	3rd. Qtr.	Delta	ETR	Second Comsat Corp. satellite to provide maritime satellite communications services. Reimbursable.
Atmosphere-D	Sept	Delta	WTR	A scientific satellite to investigate the chemical processes and energy transfer mechanisms which control Earth's atmosphere.
Atmosphere-E	Sept.	Delta	ETR	A scientific satellite to investigate the chemical processes and energy transfer mechanisms which control Earth's atmosphere.
Intelsat IVA-A	3rd Qtr	A-Centaur	ETR	First of a series of improved Intelsat Consortium satellites that will have almost double the capacity of the present Intelsat IV satellites. Reimbursable.
SMS–C/GOES–A	Oct.	Delta	ETR	First operational synchronous meteorological satellite of the National Weather Service of the Department of Commerce to provide continuous day and night global cloud-cover observations. Reimbursable.
Dual Air Density	2nd. Half	Scout	WTR	Two scientific spacecraft will be placed in orbit to obtain simultaneously measurements of the composition of upper and lower levels of the atmosphere.
RCA-A	4th Qtr	Delta	ETR	First of a series of domestic communications satellites for RCA. Reimbursable.
CAS-C/CTS	4th Qtr	Delta	ETR	Canadian-U.S. cooperative experimental communications satellite to develop and test the technology of high-power satellite communications systems.
Intelsat IVA-B	4th Qtr.	A-Centaur	ETR	Second of a series of improved Intelsat Consortium satellites. Reimbursable.

CDCS-A	4th Qtr.	A-Centaur	ETR	Domestic communications satellite for Comsat Corp. Reimbursable.
Relativity (Gravity Probe)	1975	Scout	WI	Scientific satellite to make a test of Einstein's Theory of Relativity.
Marisat-C	1975	Delta	ETR	Comsat Corp. satellite to provide maritime satellite communications services. Reimbursable.
1976				
HELIOS-B	Jan.	TIII-Centaur	ETR	Second West German/NASA cooperative satellite to investigate the properties of the processes in interplanetary space close to the Sun.
RCA-B	1st. Qtr.	Delta	ETR	Second domestic communications satellite for RCA. Reimbursable.
NATO-C	1st Qtr.	Delta	ETR	Communications satellite in synchronous orbit to perform communications relay for NATO. Reimbursable.
LAGEOS	1st Qtr.	Delta	WTR	Laser-reflecting satellite to demonstrate relevant space techniques that will contribute to the development and validation of predictive models for earthquake hazard alleviation, ocean-surface conditions and ocean circulation.
CDCS-B	1st Qtr.	A-Centaur	ETR	Second domestic communications satellite for Comsat. Reimbursable.
Intelsat IVA-C	1st Qtr	A-Centaur	ETR	Third of a series of improved Intelsat Consortium satellites.
Westar-C	April	Delta	ETR	Backup domestic communications spacecraft for Western Union. Reimbursable.
ESRO-GEOS	2nd. Qtr.	Delta	ETR	ESRO spacecraft to support space applications geoscience experiments and solid earth physics. Reimbursable.



Final Touches Added to LAGEOS—Technicians at the Marshall Space Flight Center, John B. Connor (left) and Carl F. Fetzer, work to complete final assembly of the flight article Laser Geodynamic satellite (LAGEOS) structure, including fitting 436 precision optical retroreflectors into the satellite's surface.

A View of What's to Come—This scale model of the Spacelab, behind which stands Nancy Weisenberg of Rockwell International's Space Division, is from VFW-Fokker, the European manufacturer. It was shown at the recent meeting in Washington of the American Institute of Aeronautics and Astronautics and will be on display at the Kennedy and Johnson Space Centers before its return in time to be shown at the Paris Air Show later this year.

Are you getting your **1 cent** worth from space?

For a penny of your tax dollar,
you are getting, among other things

A Program to Eliminate Airplane Vortex Hazard

One of the most baffling problems facing the aviation industry is the vortex, that hazardous, coil-like cylinder of rapidly-spiraling air that trails in varying degree from the wings of moving planes.

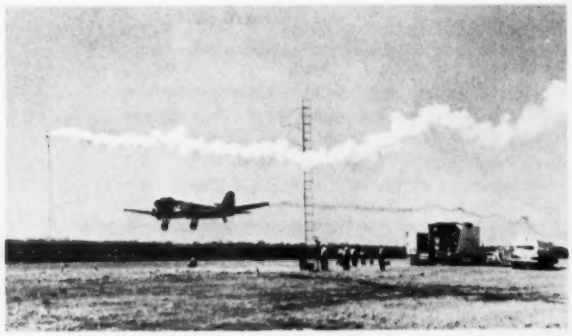
Vortices have been tracked as far as 15 or more miles behind the generating aircraft. They cause many accidents. They can turn over trailing aircraft as they approach a landing. They cause delay in successive takeoffs. They contribute to congestion around airports because of the need to maintain safe separation distances. They increase fuel consumption.

Time has magnified the problem. As planes, such as the jumbo jet, have increased in size, the hazard has become greater.

Over a long period, NASA has tried to do something about it, and now the agency feels it is on the right track. Underway is an intensive, agency-wide program devoted to studying the causes and effects of vortices. Fullscale flight tests are carried out at NASA's Flight Research Center at Edwards, CA, while other tests are conducted at Ames, Langley and Marshall Research Centers.

Years ago, first flights aimed at solving the problem were conducted at FRC. There, using smoke generators at various points along the trailing edge of a wing, tests have been made on large and small aircraft and in wind tunnels.

Some apparent solutions have been spotted. It has been found out, for instance, that by altering the flap settings and the various distributions of flaps at the rear of a plane's wing, the intensity of the vortices can be



reduced. Other things, such as gear configuration and engine throttle settings, also affect the amount of energy in a vortex.

"All in all," recently commented Dr. David R. Scott, Director of FRC, "I think we're beginning to have an understanding of what types of things can be done to reduce the vortices. The next step, of course, is the application of these techniques to insure not only reduction of the vortex hazard, but also to maintain the operational capability of the generating aircraft."

NASA

National Aeronautics and
Space Administration

"For the benefit of all mankind"

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